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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DANIEL W. CUSHING, EUGENE A. JACKSON,
KEITH H. NOVAK, DAVID N. DUNN and GREGORY R. BELL

Appeal 2009-002873
Application 10/707,612
U.S. Patent Publication 2005-0142968
Technology Center 1700

Decided: August 18, 2009

Before: FRED E. McKELVEY, *Senior Administrative Patent Judge*,
and SALLY GARDNER LANE and SALLY C. MEDLEY, *Administrative
Patent Judges*.

McKELVEY, *Senior Administrative Patent Judge*.

DECISION ON APPEAL

1 A. Statement of the case

2 The Boeing Company ("Boeing"), the real party in interest, seeks
3 review under 35 U.S.C. § 134(a) of a final rejection (mailed 09 March
4 2007).

5 Claims 1-2 and 4-5 are in the application.

6 The application was filed on 24 December 2003.

1 The Examiner relies on the following evidence:

Tsotsis	U.S. Patent Publication 2004/0219855	04 Nov. 2004
Gomez	U.S. Patent 5,319,003	07 Jun. 1994
Celanese I	Complete Textile Glossary, Celanese Acetate—definition of "nonwoven fabric"	2001
Celanese II	Complete Textile Glossary, Celanese Acetate—definition of "fabric"	2001

2

3 The reader should know that "et al" is not used in this opinion.

4 All evidence relied upon by the Examiner is prior art under 35 U.S.C.
5 § 102(b).

6 We have jurisdiction under 35 U.S.C. § 134(a).

7 B. Findings of fact

8 The following findings of fact are supported by a preponderance of
9 the evidence.

10 References to the specification are to U.S. Patent Publication
11 2005/0142968 A1.

12 To the extent that a finding of fact is a conclusion of law, it may be
13 treated as such.

14 Additional findings as necessary may appear in the Discussion portion
15 of the opinion.

1

The invention

2 Boeing's invention generally relates to composite materials and more
3 specifically to translucent, flame resistant composite materials that are said
4 to be useful in aircraft interiors and other aerospace applications.

5 Specification, ¶ 0001.

6 According to Boeing, prior art plastic materials used in commercial
7 aircraft do not typically achieve the combination of a desired transmissivity
8 of light while meeting FAA [Federal Aviation Administration] requirements
9 in terms of flammability resistance properties, vertical burn, smoke
10 emissions tests, and toxic fume emissions tests. Interior components have
11 typically been made of non-translucent (opaque), or marginally translucent
12 plastic materials that meet these FAA requirements. Specification, ¶ 0004.

13 Boeing's invention is said to involve composite materials that meet or
14 exceed the FAA requirements in terms of flammability resistance properties,
15 including heat release, vertical burn, smoke emissions tests, and toxic fume
16 emissions tests. The composite materials are said to be capable of post-
17 processing to form various translucent components used throughout the
18 interior of a cabin on an aircraft that allow transmissivity of desirable
19 amounts of light. Specification, ¶ 0006.

20 The composite material consists of long glass fibers encapsulated
21 within a polyphenylsulfone (PPSU) substrate material. The long glass fibers
22 are preferably configured within a loose weave or may alternatively be
23 unidirectional in nature so long as the fibers meet the requirements for light
24 transmission and flammability. Specification, ¶ 0007.

1 The composite material is formed as a two-layer or three-layer
2 system. In the two-layer system, the glass fibers are laminated to one side of
3 the PPSU substrate. In a three-layer system, the glass fibers are sandwiched
4 between and laminated to two layers of the PPSU substrate. Specification,
5 ¶ 0008.

6 Fig. 15, reproduced below, is a side view of a two-layer composite
7 material having weaved fibrous material used to form translucent
8 components. Specification, ¶ 0011.

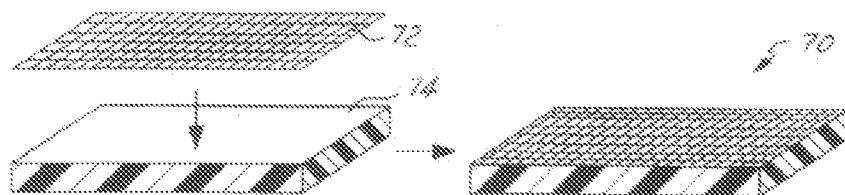


FIG. 15

9
10 Fig. 15 depicts a two-layer composite.

11 Fig. 16, reproduced below, is a side view of a three-layer composite
12 material used to form translucent components. Specification, ¶ 0012.

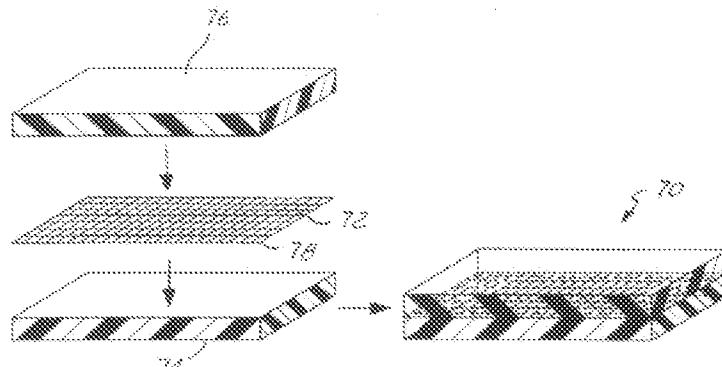


FIG. 16

13
14 Fig. 16 depicts a three-layer composite.

1 In Fig. 15, a two-layer composite material 70 is formed by laminating
2 a layer of weaved fibrous material 72 to a substrate material 74.
3 Specification, ¶ 0021.

4 In Fig. 16, a three-layer composite material 70 is formed by
5 introducing second layer of substrate material 76 having the same
6 composition as first layer 74 such that the fibrous material 72 is sandwiched
7 and laminated between first and second layer 74, 76. Specification, ¶ 0021.

8 In Fig. 17 [not reproduced], an alternative embodiment describes a
9 unidirectional, nonweaved fibrous material 72 laminated to the substrate
10 material to form another two-layer translucent composite material 70.
11 Specification, ¶ 0021.

12 The substrate material 74 is chosen based on the application for which
13 it is utilized. In the case of airplane interior components, the substrate
14 material 74 is chosen to allow adequate light transmissivity for the desired
15 component. The substrate material 74 has the ability to soften to permit
16 lamination of the fibrous material 72 as well as being able to be post
17 processed to form a translucent component having a desired shape and
18 thickness. Specification, ¶ 0023.

19 One thermoplastic resin that meets these requirements is
20 polyphenylsulfone, otherwise known as PPSU. PPSU is a translucent
21 thermoplastic material that is relatively light transmissive and typically has a
22 light brown tint. As one of ordinary skill appreciates, many grades of PPSU
23 are commercially available, each having slightly varying transmissivity and
24 flammability resistant properties. Specification, ¶ 0024.

1 The fibrous material 72 is added to PPSU substrate 74, 76 to provide
2 retention of the composite panel 60 [Fig. 14—not reproduced] in the event
3 of fire. The fibrous material 72 laminated within the substrate or substrates
4 74, 76 is said to allow compliance with the FAA certification requirement
5 for flammability resistance properties, including heat release, vertical burn,
6 smoke emissions tests, and toxic fume emissions tests. Long glass fibers 78
7 [Fig. 15] are preferred for use as the fibrous material 72 due to their ability
8 to (1) act as thermal insulators, (2) allow substrate 70 to pass flammability
9 tests, (3) not overly decrease light transmissivity, as well as (4) their overall
10 appearance within the PPSU substrate 74, 76. Specification, ¶ 0025.

Two suitable glass fibers 78 are said to be e-type and s-type glass fibers. Specification, ¶ 0027.

Claims on appeal

14 Claims 1-2 and 4-5 are on appeal.

15 Claim 1 is an independent claim.

16 Claims 2 and 4-5 are dependent claims.

17 Boeing does not argue the separate patentability of claims 2 and 4-5.

18 Accordingly, we decide the appeal on the basis of claim 1.

19 Claim 1, which we reproduce from the Claim Appendix of the Appeal
20 Brief, reads [bracketed matter and some indentation added]:

Claim 1

22 A two-layer composite material for use in translucent, flame-
23 resistant components comprising:

[1] a substantially continuous nonwoven thermoplastic polyphenylsulfone substrate; and

[2] a plurality of long glass fibers having a melting temperature above the melting temperature of said polyphenylsulfone and laminated within said polyphenylsulfone substrate,
wherein said plurality of long glass fibers is selected from the group consisting of
[a] a plurality of long s-type glass fibers and
[b] a plurality of long e-type glass fibers,
wherein said composite material
[i] has an average allowable heat release not exceeding a 65/65 standard and
[ii] can be post processed by bending, cutting or thermoforming.

Prior art

1. *Tsotsis*

15 The Tsotsis invention relates to cured composites built from layers of
16 unidirectional fibers. ¶ 0001.

17 The Examiner found that Tsotsis describes a two-layer composite
18 material formed from a substantially continuous nonwoven polyphenyl-
19 sulfone substrate material and a plurality of unidirectional long glass fibers
20 substantially embedded with the substrate material. Examiner's Answer,
21 page 3.

According to Tsotsis, a multiaxial fabric is prepared that is made of alternating layers of reinforcing unidirectional fibers and non-woven interlayers. The non-woven interlayers comprise a spunbonded,

1 spunlaced, or mesh fabric of thermoplastic fibers. The interlayers are
2 disposed between and knit-stitched to the reinforcing layers. ¶ 0020.

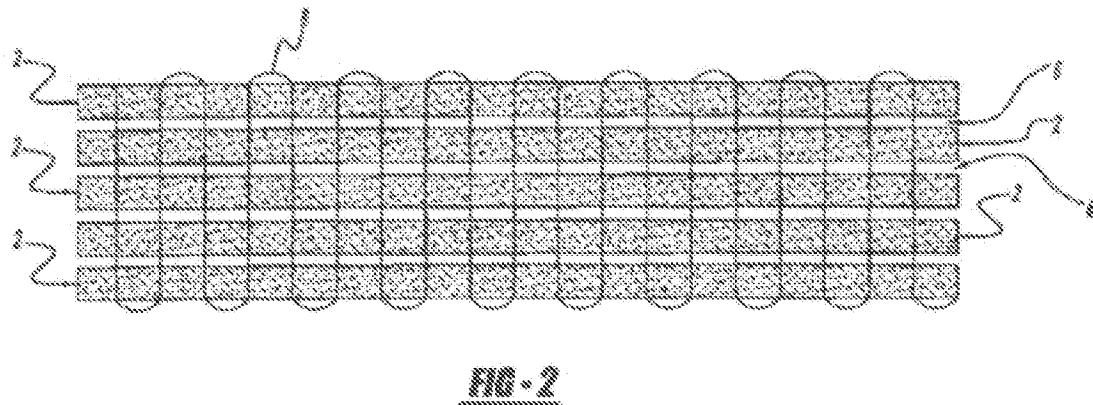
3 Layers of unidirectional fibers for use in the multiaxial preforms and
4 fiber reinforced composite materials of the invention are well known in the
5 art. In a preferred embodiment, the unidirectional fibers are made of carbon
6 fibers. Other examples of unidirectional fibers include, without limitation,
7 glass fibers and mineral fibers. Such layers of unidirectional fibers are
8 usually prepared by a laminating process in which unidirectional carbon
9 fibers are taken from a creel containing multiple spools of fiber that are
10 spread to the desired width and then melt-bonded to a thermoplastic
11 interlayer, as described above, under heat and pressure. ¶ 0022.

12 The interlayer is made of a spunbonded, spunlaced, or mesh fabric of
13 thermoplastic fibers. The thermoplastic fibers may be selected from among
14 any type of fiber that is compatible with the thermosetting resin used to form
15 the fiber reinforced composite material. For example, the thermoplastic
16 fibers of the interlayer may be selected from the group consisting of
17 polyamide, polyimide, polyamideimide, polyester, polybutadiene, poly-
18 urethane, polypropylene, polyetherimide, polysulfone, polyethersulfone,
19 *polyphenylsulfone*, polyphenylene sulfide, polyetherketone,
20 polyetheretherketone, polyarylamide, polyketone, polyphthalamide,
21 polyphenylenether, polybutylene terephthalate and polyethylene
22 terephthalate. ¶ 0023.

23 The multiaxial preform comprises a plurality of reinforcing layers
24 with interlayers disposed between the reinforcing layers and melt-bonded to
25 at least one of the reinforcing layers. It is preferred to use multiaxial

1 preforms having 4 or more reinforcing layers of unidirectional fabrics. In
2 another embodiment, the preform has from 2-16 layers of unidirectional
3 *fabrics*. ¶ 0032.

4 Fig. 2, reproduced below, shows a multiaxial preform for a composite
5 material for use in a liquid-molding process of the invention. ¶ 0037.

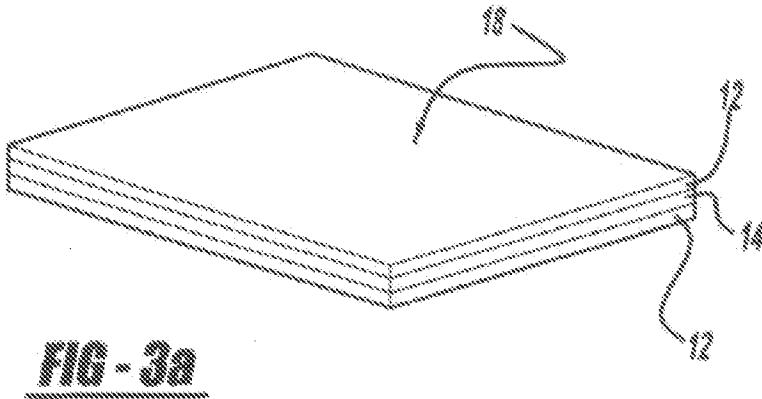


6

7 Fig. 2 depicts a multiaxial preform.

8 In Fig. 2, interlayers 6 made of thermoplastic fibers are disposed
9 between reinforcing fabric layers 2 of unidirectional fabrics. In a preferred
10 embodiment, at least some of the interlayers are melt-bonded to an adjacent
11 reinforcing fabric layer. A sewing thread 8 may be used to hold the preform
12 layers together.

13 In one Tsotsis embodiment, an interlayer material may be melt-
14 bonded to one or both sides of a unidirectional dry fabric to produce a dry
15 unidirectional tape. ¶ 0040. Fig. 3 [not reproduced] illustrates such a
16 process. The product produced by the Fig. 3 process is shown in Fig. 3a,
17 reproduced below.



1

Fig. 3a depicts a three-layer composite.

3 FIG. 3a shows a detail of the construction of a fabric 18
4 with interlayer material 12 melt bonded to *both* sides of the unidirectional
5 dry fabric 14. ¶ 0040.

6 In an alternative embodiment, the veil material 12 may be
7 melt-bonded to only *one* side of the unidirectional fibers 14. ¶ 0040.

8 2. Gomez

9 The Examiner relies upon Gomez to show that e-type and s-type glass
10 fibers are known. Gomez, col. 3:28-32.

11 Examiner's rejection

12 The Examiner rejected claims 1-2 and 4-5 as being unpatentable under
13 35 U.S.C. § 103 over Tsotsis and Gomez.

14 C. Discussion

15 (1)

16 A first argument on appeal seems to rely on the fact that Boeing's
17 claimed composite is two-layer. Reply Brief, page 1.

1 While Tsotsis Fig. 3a describes a three-layer product, Tsotsis also
2 explicitly describes a two-layer product. ¶ 0040.

3 Boeing's two-layer requirement is therefore described in the prior art.

4 (2)

5 A second argument on appeal maintains, with reference to Tsotsis
6 Fig. 2, that Tsotsis involves the use of fabrics. Boeing maintains, however,
7 that the claimed composite involves "nonwoven, *non-fabric* composites"
8 (italics added). Appeal Brief, page 9.

9 After consulting dictionary definitions of "nonwoven fabric"
10 [Celanese Acetate I] and "fabric" [Celanese Acetate LLC II], the Examiner
11 concluded that claim 1 does "not exclude a fabric substrate." Examiner's
12 Answer, page 7. The Examiner goes on to find and conclude (*id.*):

13 Rather, the current claims simply exclude a woven fabric
14 substrate. Since a non-woven fabric is not a woven fabric,
15 Tsotssis teaches the claimed substrate.

16 In our view, the Examiner got it right. Boeing's argument overlooks
17 the breadth of claim 1.

18 Claim 1 calls for a "nonwoven . . . substrate" not a "nonwoven, *non-*
19 *fabric* . . . substrate." The "nonwoven" material may be a nonwoven fabric,
20 which Boeing seems to agree is (Appeal Brief, page 10):

21 [a]n assembly of textile fibers held together by mechanical
22 interlocking in a random web or mat

23 Tsotsis describes the use of spunbonded, spunlaced, or mesh fabric,
24 none of which are reasonably characterized as woven fabric. Each is a
25 "nonwoven . . . substrate" within the meaning of claim 1.

1 Boeing's argument overlooks the fact that "non-fabric" does not
2 appear in claim 1.

(3)

4 The Examiner found that Tsotsis does not describe the use of e-type or
5 s-type glass fibers. *See e.g.*, Examiner's Answer, page 4.

6 Tsotsis describes the use of glass fibers. As of the date of the Tsotsis
7 invention (Tsotsis filed on 2 May 2003), Gomez (issued 7 June 1994) tells
8 us, and those skilled in the art, that e-type and s-type glass fibers were
9 known. The fact that Gomez describes the use of e-type and s-type glass
10 fibers in a context arguably different from that of Tsotsis or Boeing does not
11 take away from the fact that e-type and s-type glass fibers were known prior
12 to both Tsotsis and the making of the invention on appeal. The Examiner
13 probably could have cited any number of references to show that e-type and
14 s-type glass fibers were known.

15 It is not apparent why one skilled in the art would not, and should not
16 be able to, freely use e-type or s-type or other known glass fibers when
17 practicing the Tsotsis invention.

18 An invention achieving some unpredictable result may be patentable
19 under § 103. *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398 (2007); *United*
20 *States v. Adams*, 383 U.S. 39 (1966). What is unexpected about the use of
21 e-type or s-type glass fibers? Boeing claims to have unexpectedly come up
22 with a composite which will pass, if not exceed, FAA requirements for
23 airplane component parts. Specification, ¶¶ 0004 and 0006. However,
24 Boeing nowhere in the Appeal Brief or Reply Brief calls our attention to any
25 evidence of record which would support a finding of unexpected results—or

1 that any result achieved with the claimed invention is not achieved with
2 other composite materials currently used in aircraft. Consistent with *KSR*,
3 *In re Klosak*, 455 F.2d 1077, 1080 (CCPA 1972), counsels that an inventor
4 must show that the results the inventor says the inventor gets with the
5 invention are actually obtained with the invention and it is not enough to
6 show results are obtained which differ from those obtained in the prior art—
7 any difference must be shown to be an unexpected difference.

8 (4)

9 Boeing discusses crimped fibers and suggests that crimped fibers have
10 utility in fields removed from Boeing's field. Appeal Brief, page 10. The
11 Examiner had a complete answer to the argument (if it is in fact an
12 argument). To the extent that the preamble of claim 1 is a limitation (a
13 highly doubtful proposition), the composites upon which Tsotsis claims to
14 have improved are useful in the aerospace industry. Tsotsis, ¶ 0002.
15 *See also* Examiner's Answer, page 6.

16 (5)

17 We have considered Boeing's remaining arguments and find none that
18 warrant reversal of the Examiner's rejection. *Cf. Hartman v. Nicholson*,
19 483 F.3d 1311, 1315 (Fed. Cir. 2007).

20 D. Decision

21 Boeing has not sustained its burden on appeal of showing that the
22 Examiner erred in rejecting the claims on appeal as being unpatentable under
23 § 103 over the prior art.

24 On the record before us, Boeing is not entitled to a patent containing
25 claims 1-2 and 4-5.

Appeal 2009-002873
Application 10/707,612

1 Upon consideration of the appeal, and for the reasons given herein,
2 it is

3 ORDERED that the decision of the Examiner rejecting
4 claims 1-2 and 4-5 over the prior art is *affirmed*.

5 FURTHER ORDERED that no time period for taking any
6 subsequent action in connection with this appeal may be extended under
7 37 C.F.R. § 1.136(a)(1)(iv) (2008).

AFFIRMED

KMF

cc (via First Class mail)

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